RESEARCH AND TECHNOLOGY REPORT

1. Title Multi-Objective Optimal Scheduling for Space Science Applications		**2. Date Prepared** 09 29 2008
3. Performing Organization: Jet Propulsion Laboratory		**4. NASA Current WBS#**
5. JPL Project/Task Number: **102294 982745.03.15**	**(Per GSK Policy, this serves as the Work Authorization Document)**	**6. Awarded Years** **3**
7. Investigator Telephone **PI: Dr. M. Giuliano, STScI 4103384470** **Co-I: Dr.M Johnston JPL 8183930582**	**8. NASA Program Manager** **Bredekamp**	**9. NASA Division** SMD

10. Reference(s):
ROSES NRA Program Element Title: ROSES AISR
Is this a Co-Investigator Task? yes
Is this an Other than Solicited Task? no

11. Funding Profile:

FY'08 Approval	FY'09 Guideline	FY'09 Request	FY'09 Overguide	FY'10 Request
$ 110K	$ 112K	$ 112K	$ 0K	$ 113K

(these values represent JPL's portion – 50% – of the total proposal levels)

12. Description (Current year progress, next year's goals/objectives, publications)
(If this is a final report, please state that as well)

During the first 10 months of the grant period we made substantial progress towards building and demonstrating a multi-objective multi-participant schedule optimization system for space science missions.

- Multi-Objective system architecture (1st quarter) – we designed and implemented a system architecture for multi-objective, integrating the Java based GDE3 evolutionary algorithm driver (JPL) with the LISP based SPIKE scheduling engine (STScI).
- JWST scheduling test-bed (1st - 2nd quarter) – we implemented a JWST scheduling test-bed that allows multi-objective algorithms to be exercised scheduling JWST observations, utilizing constraints and resource data from JWST mission simulators
- Initial JWST Experiments (2nd - 3rd quarter) – A set of experiments were performed utilizing the test-bed using the JWST Science Observation Design Reference Mission as input. The experiments verified the utility of multi-objective scheduling in the JWST domain and explored alternative techniques for exploring the search space.
- Model based Scheduler Design and Multi-User Support (3rd - 4th quarter) – we started investigating these elements and they will be the main focus next year.

Next year goals include:

- Model-based scheduling: develop and incorporate model-based techniques into the testbed
- Conduct experiments on adapted system
- Investigate and prototype approaches for multi-participant interaction with the system
- Design second mission testbed

Publications: "Multi-Objective Evolutionary Algorithms for Scheduling the James Webb Space Telescope", 2008 International Conference on Planning and Scheduling (ICAPS), Sydney Australia, Sept. 14-18 2008.

Approval: **Date:**	**Concurrence:** **Date:**